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Investigation of the machinability of non-conductive ZrO₂ with different tool electrodes in EDM (Article)

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Abstract

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Electrical discharge machining (EDM) is a non-conventional process where complex and difficult-to-cut materials can be machined. Adhesive copper foil as an assisting electrode (AE) is used to cover the zirconia (ZrO₂) surface to start the primary spark between the tool electrode and workpiece. Kerosene is dissociated and produces a carbon layer on the workpiece surface when machining of the initial copper foil is completed. Thus machining continues although ZrO₂ is a non-conductive material. In this study, the EDM of ZrO₂ is investigated with graphite, copper and brass tool electrodes. Material removal rate (MRR) and surface characteristics are analysed. Experiments are performed by varying the parameters peak current and pulse-on time with different tool electrodes. From the experiments, MRR on ZrO₂ has been compared for three different tool electrodes. It is found that the graphite tool electrode performs the highest MRR for EDM of ZrO₂. The least MRR is obtained by the brass tool electrode. However, better surface quality is observed with the copper tool electrode than EDM with brass or graphite electrodes. This investigation with varying machining parameters and different tool electrodes can be helpful in finding an effective use of the EDM process.

Author keywords

Assisting electrode Conductive layer Electrical discharge machining Material removal rate Non-conductive ceramics

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